

321 CONTACT

Flying Into
the Future





No, that's not a funny frisbee this man is about to catch. It's one of the world's oldest toys—a boomerang. Boomerangs are part of this special flight issue.

You can find out what we're doing in the air if you check out what's on the air. Five episodes about flight make up just one of the weeks planned for this season's 3-2-1 CONTACT television show.

Meanwhile, you can read all about boomerangs and even make one of your own. Just fly on over to page 22.

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Page 4



Page 10

321 CONTACT

Page 16



Page 18



Page 20



Page 32



Page 34



Featuring This Month

- 4** Wings and Things: The Secrets of Animal Flight
- 12** LTAs Away!: A New Kind of Airship Gets Off the Ground
- 20** Poster: How High Do They Fly?
- 22** The Return of the Boomerang
- 26** Coast to Coast: A Game
- 28** The Bloodhound Gang: The Search for Planet X (Part Two)

Plus Our Regular Departments

- 8** Factoids
- 10** Any Questions?
- 16** List of the Month: Famous First Flights
- 18** Contact Report
- 31** Do It!: Planet Maze
- 32** Mail
- 33** Letters
- 34** Extra!
- 37** Did It!
- 39** Earth Works: Frost



WINGS AND

THE SECRETS OF ANIMAL FLIGHT

Have you ever wished you could leap into the air and fly like a bird? Unfortunately, the closest you can come to flying is in a machine that's built for flight, like an airplane or a glider.

Yet some animals make flying look so easy. Bumblebees zip from flower to flower. A seagull glides for hours without even flapping its wings. How do they do it? Their secret is that, like an airplane, their bodies are specially built for flying.

First, flying animals weigh very little compared to non-flyers. Most insects are such good fliers because their weight doesn't bog them down. Birds are light-weights, too—their bones are hollow. Take the brown pelican. It weighs 16 pounds (7 kg) but its skeleton is less than one pound (.4 kg).

Another important secret is an animal's shape. A flying animal's body is *streamlined*. The air can flow smoothly past it. In flight, a bird's legs fold tightly against its body. The feathers also mold its body into a smooth shape.

Wings are also specially shaped for flight. Slightly curved on the bottom, more curved on top.

This shape is like an airplane wing. All true flying animals have these wings, but you can see the shape most clearly in a bird. The bird's wing splits the air going past it. Some air goes over the top, the rest under the bottom. Air flowing over the more curved part has a greater distance to travel so it moves faster than the air underneath. And since there's less air pressure over the wings than underneath, the bird is lifted up, up and away.

Once an animal leaves the ground, its flapping wings keep it moving forward. For birds, their shoulder and chest muscles are much more developed than yours to produce the strength needed for all that flapping. Somewhat like a plane's propeller pushes air over its blades to create thrust, a bird keeps moving forward by the thrust of its wings.

When you think about it, the variety of flying creatures is amazing. There are big ones and small, fast fliers and slow. Some travel long distances and others only fly from branch to branch. Each has adopted a way of flying that suits its style of living. Here is a look at a few of the fanciest flying animals.

Dive-Bomber Bird

The peregrine falcon uses a dive-bomb method of flying. During a dive, it can reach a speed of over 180 m.p.h. (290 km.p.h.). It has to. The peregrine hunts smaller flying birds for food. The peregrine swoops along until it spots its prey below. Then it gives several strong forward thrusts with its wings before folding them close to its body. The peregrine drops toward the ground. Then, bam! It hits its prey in the air, stunning it with its talons and catching it.



by Lisa Hsia



Humming Helicopter

If you see a tiny bird hovering near a flower, you've probably spotted a hummingbird. This little fellow can hold itself in one spot, just like a helicopter. The small wings flap over 50 times a second. That pushes a stream of air down which helps keep the hummingbird up. All that flapping takes a lot of energy. So hummingbirds eat 50 to 60 meals a day.



Hang Glider

Some birds can fly while hardly flapping their wings at all. Take the albatross, for example. It sometimes seems to go straight up in the air for 100 feet (30.4 m) without a single wing beat. The bird is hitching a free ride on a current of air that is rising off the ocean. Then it can simply lock its wings into position and concentrate on looking for food. People who fly in hang gliders use air currents to stay in the air, too.

Duzzing Bees

If your arms get tired carrying something heavy, you can imagine how a bee must feel. It carries more than its own weight in pollen back to the hive. That saves the work of having to make lots of trips between the flowers and its home. Bees get their flying strength from two sets of wings. The front ones have a smaller pair behind them that actually hook on to the others to create a broad flying surface.

Soaring Squirrels

When a flying squirrel wants to go somewhere, it scampers up a tree and jumps. But the squirrel isn't a true flier. It's more like a sky diver. Its "wings" are actually folds of loose skin that hang between its wrists and ankles. By spreading this skin, the squirrel can glide through the air as far as 50 feet (15.2 m). Just before landing, the squirrel flicks back its tail and puts down its feet to form a neat parachute with its body. This provides a comfortable brake for landing.





Night Fliers

You've probably only seen the shadows of bats in flight since they fly at dusk or night. They are out looking for food. Bats are the only true flying mammals in the world. With fur instead of feathers, their wings are made of skin and bone. A thin layer of skin connects their arm bones with their legs. This wing membrane catches the air just like the wing of a bird. Using it, a bat can swoop off to catch a big dinner of insects.

Flying Hopper

One insect that can both jump and fly is the grasshopper. Whenever a grasshopper senses that an enemy is nearby, it will jump for a quick escape. Using its large hind legs, it springs into the air. Once a grasshopper gets off the ground, it can fly like a plane. A stiff upper pair of wings spreads out straight. Underneath, a lower, more delicate pair act like a pair of oars. Upon landing, the wings fold up in neat little pleats.



Factoids



John Winslow of Gloucester, Virginia, kept a yo-yo going for 120 hours on November 23–28, 1977—a record!



A cow gives enough milk each day to fill 62 glasses.



There are more than 90,000 libraries in the United States.

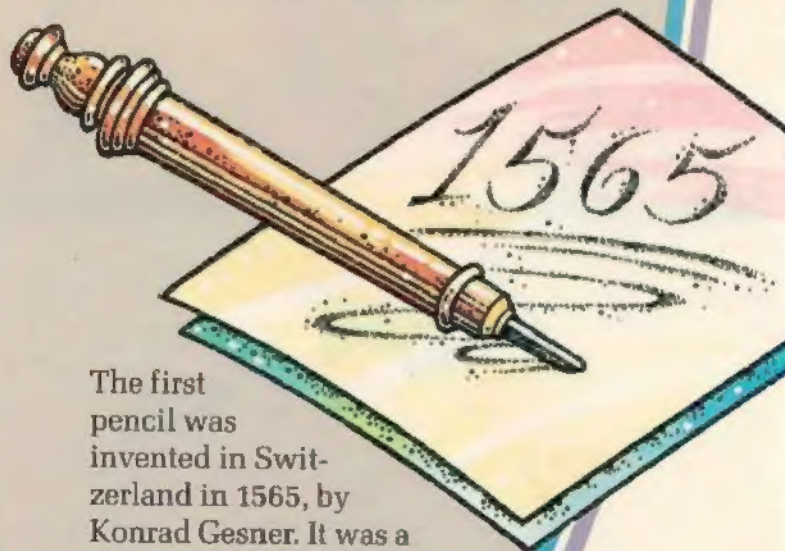


You breathe about 10 million times a year.



The fastest elevators in the world are in the 60-story "Sunshine 60" building in Tokyo, Japan. They travel at a speed of more than 22 miles an hour.

The average kid stays home sick from school five days a year.



The first pencil was invented in Switzerland in 1565, by Konrad Gesner. It was a piece of lead held in a wooden container.

Any Questions?

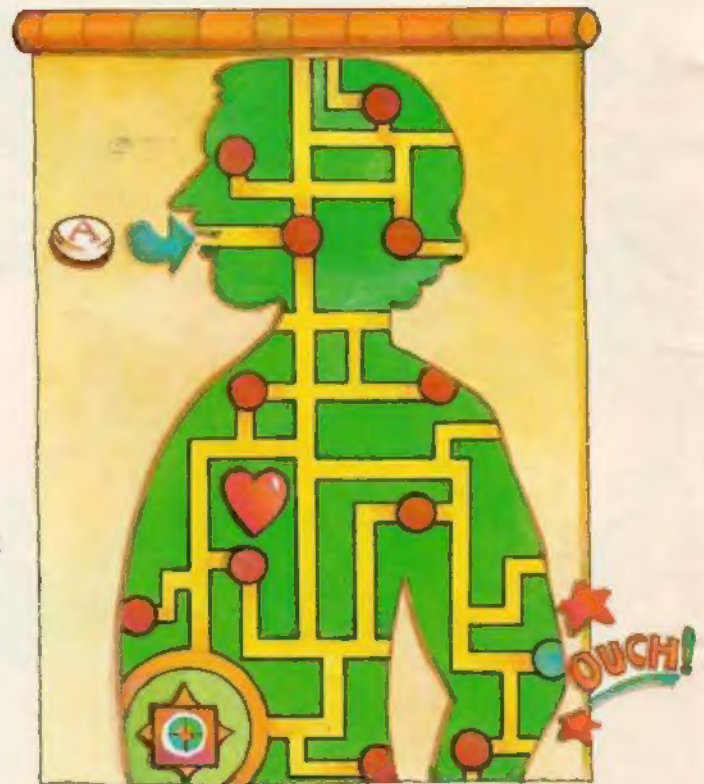
When you take aspirin, how does it know where you hurt?

Suppose you exercise too much and hurt a muscle. Nerves near your aching muscle send a pain signal to your brain. What's the message? OUCH! The pain is your body's way of letting your brain know that something is wrong.

When you take the aspirin, it enters your bloodstream from your stomach. Then your blood carries it all over your body. The aspirin doesn't "know" where you hurt. It goes everywhere, even to parts that don't hurt.

In about a half hour, the aspirin reaches the source of those pain signals. Doctors believe that aspirin works where you hurt. It stops some of the pain signals from being sent. Since the signals can't get to your brain, there's nothing to tell you that you're hurting. So, for a little while at least, you feel better.

Question sent in by Mindy Baumgartner, Englewood, CO.



How do you get a black and blue mark?

Remember the last time you banged your knee? The skin didn't break, so you didn't bleed outside. But some bleeding took place anyway—under the skin. Your body stops this bleeding the same way it stops the bleeding from a cut. The blood thickens and forms a clot.

What does this have to do with black and blue marks? Just about everything. Those marks are caused by the bleeding underneath your skin.

When blood is in your blood vessels, the oxygen there gives your blood its red color. When you bump yourself, some blood leaks out of the blood vessels. The blood can't get oxygen, so it loses its red color.

The blood changes from a red color to a dark purple. Over time it changes to blue, then green, and finally yellow. The changing colors mean the blood cells are breaking down. When this process is finished, the clotted blood gets washed away. Then the black and blue mark disappears.

Question sent in by Stacy Pfeiffer, Folsom, CA.



Do you have a question that no one seems able to answer? Why not ask us? Send your question, along with your name, address, and age, to:

Any Questions?
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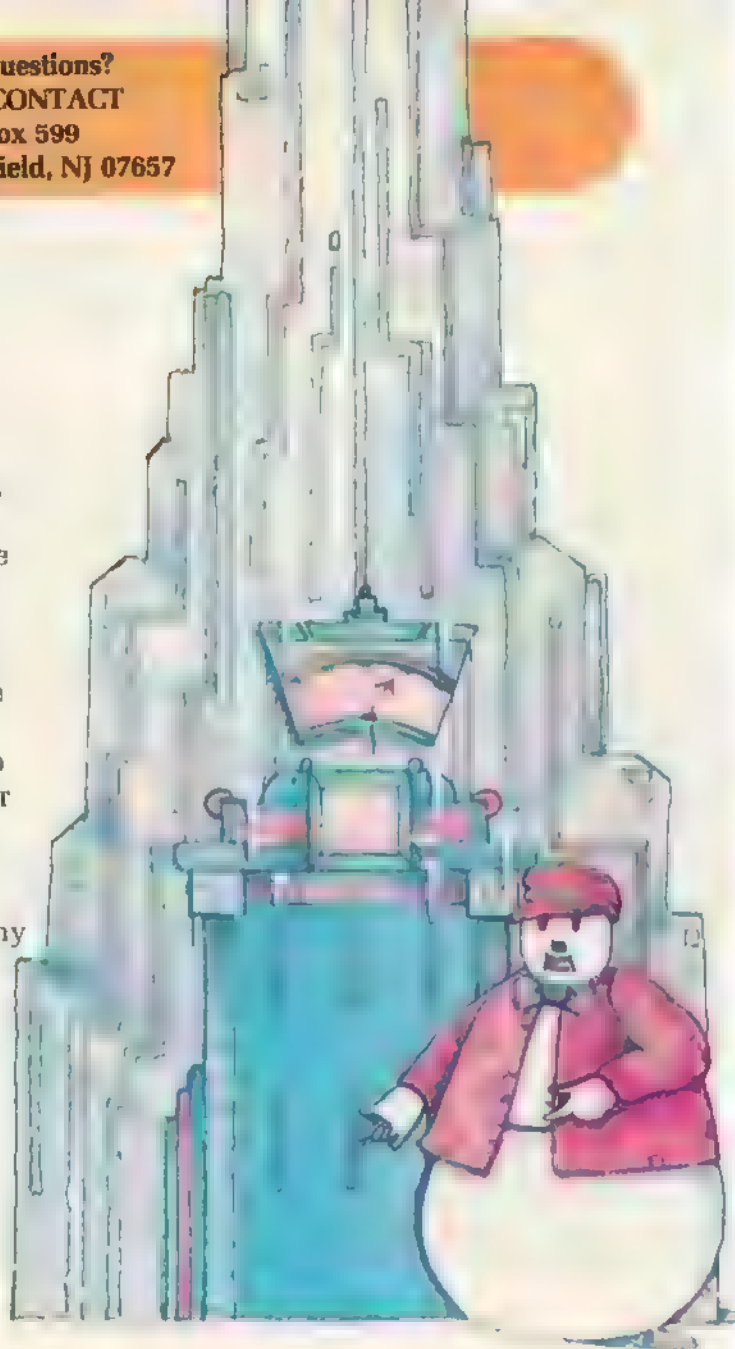
How do icebergs get in the ocean?

Icebergs don't start out in the water. They begin high in the mountains. Year after year, snow piles up. As it gets packed down, the snow turns to solid ice. This huge sheet of ice then starts to slide slowly down the mountain-side. It moves from three inches (7.5 cm) to six feet (1.8 m) a day. This slow-moving river of ice is still not an iceberg. It's a glacier.

When the glacier reaches the coast, there's no more land for it to travel on. The end hangs over the water. Huge chunks of ice break off. When they fall into the ocean, they become icebergs. This process is called **calving**.

Icebergs come in many shapes and sizes. Many of them are about the size of a car or a house. That may sound pretty big. But it's not when you're talking about icebergs. The biggest one ever seen was as tall as a 50-story building!

Question sent in by Laura L. Black, West Redding, CT.



Why do cats have rough tongues?

If you have ever been licked by a cat, you know that its tongue is not the same as yours. A cat's tongue feels a little like a piece of wet sandpaper.

If a cat had a smooth tongue like a person's, it couldn't do such a good job of cleaning its fur. But a cat's tongue is covered with tiny little points. They make a cat's tongue like a miniature brush. It combs and cleans with each lick.

A cat's rough tongue is good for other things, too. If you get a chance, watch a cat eat a bone with meat on it. As it licks, its tongue scrapes meat right off the bone.

A cat also uses its talented tongue to do some pretty fancy drinking. Its tongue has special muscles. Using them, a cat can curl its tongue to form a kind of spoon. That helps the cat lap up whatever it's drinking. Slurrrp!

Question sent in by Phillip Bruce.



LTA's NEW KINDS OF AIRSHIPS

GET OFF THE GROUND



Someday in the future you may feel like you're in the middle of a Star Wars movie. Right above you in the sky is a huge airship. It is not like any aircraft you've ever seen. It's as big as an 18-story building. Hanging motionless, almost soundless, it could be the Empire's newest cruiser.

Don't panic! You're not looking at Darth Vader's new home. Instead, it's one of a group of new airships. They're called lighter-than-air vehicles or LTAs.

You've probably already seen some old-style LTAs, even though you didn't call them that. You know them as hot-air balloons and blimps. They take a few people up into the sky to sight-see or to photograph sports events. But in a few

years, balloons and blimps may be overshadowed by the big new LTAs.

Trucks of the Air

All LTAs use bags full of helium or another lighter-than-air gas to lift them off the ground. When helium is pumped into a bag or container, the whole thing floats up into the sky. The bigger the container, the more weight this light gas can lift. The blimps you've seen have a gas bag shaped like a huge fat cigar. But the new LTAs will look different.

One model looks like a baseball with a handle on the bottom. Another is actually a cross between a blimp and a helicopter. It looks a little like a flying eggbeater. All these new airships will use light gases to help lift very heavy loads.

Left: This Canadian airship is six stories high and long enough to stretch halfway across a football field. The little cabin underneath carries passengers. The rest of the huge ship is filled with helium gas.

Right: A giant baseball with a handle? No, it's the Van Dusen. This LTA has a motor on each side that makes it go. The large gas-filled ball also spins to help carry it up, up and away.



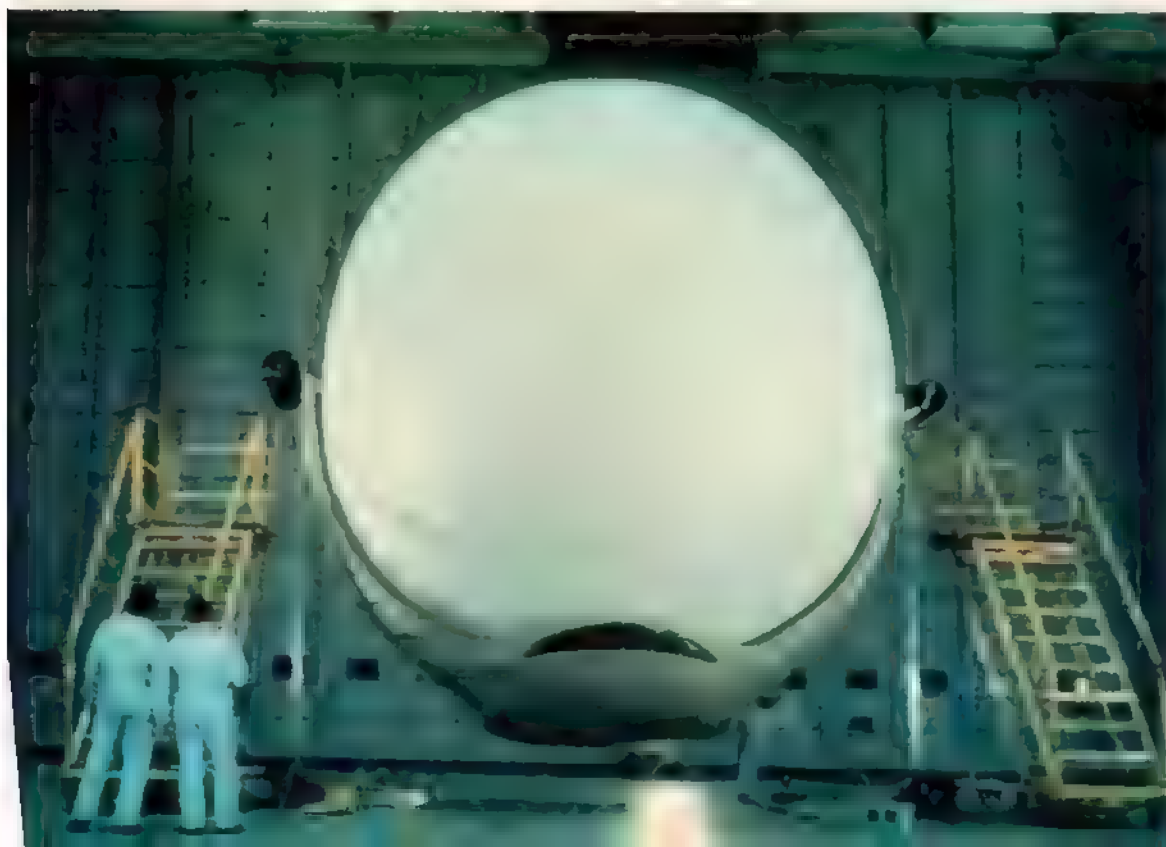
Though they may look weird, the new LTAs are important. Whenever people need to pick up something really heavy that weighs 50 tons or more, they'll use these slow-flying "trucks of the air."

Imagine that you needed an entire house delivered to a new place you wanted to live. An LTA could do the job. Or one could lift a train that's gone off its track. An LTA might also serve as an air taxi. It could move people from an airport in the suburbs to the downtown part of a

big city. Or it might make short hops between neighboring cities.

One of the best things about new LTAs is that they will not harm the environment. They'll keep the air cleaner because they use less gasoline than planes or helicopters. They are also quieter and won't add to noise pollution. And LTAs can hover over one spot. They could help to clean up oil spills in the ocean or to fight forest fires.

LTAs will go into forests and haul out ➤



Left: This 20-foot model was made just for testing. The real airship will be eight times bigger. It will travel up to 70 miles (113 km) per hour and lift loads as heavy as 80 tons.

trees such as Douglas firs that weigh up to 35 tons. With the help of these aircraft, people can move lumber without having to build new forest roads. That means the plants and wild animals in the woods can be kept safe and undisturbed. And soil will be protected from erosion.

Early Airships

Airships have been up in the air for a long time. In fact, the first one was flown in 1851. That was quite a few years before the first airplane got off the ground. Inventors went on to develop several different kinds of lighter-than-air vehicles. They were powered by gasoline engines and could be steered by rudders and

cables. People used these early airships to travel from place to place. The aircraft also delivered mail and escorted ships at sea. During war time, pilots dropped bombs from airships.

But compared to heavier-than-air craft such as helicopters and airplanes, airships were very slow. They were also hard to steer, especially during high winds and bad weather. Many crashed and some exploded. So, for the most part, LTAs were forgotten for a while.

Below: The Cyclo-Crane is an airship that can carry 54 tons of logs at a time. Canadian foresters hope the Cyclo-Crane will help move timber during winters when forest roads are blocked by snow.





Airships Make a Comeback

Airships began to interest inventors again a few years ago. Gasoline was becoming very expensive. So people began trying to develop LTAs that could more cheaply handle the heavy lifting that helicopters had been used for. This time inventors had new lightweight materials to replace aluminum and steel. There are also new designs that could make LTAs better than ever.

Look at the Canadian airship called the LTA-20, on page 31. It has a round ball that spins between what looks like handles on its sides. Engines in the handles will rotate the ball. This spinning motion actually increases the lift provided by the helium inside the ball. This LTA is designed to take advantage of something called the Magnus Effect. It's what you see happening when a baseball pitcher throws a fast ball. The spin he puts on the ball combines with its forward motion to make it soar.

The Magnus Effect helps this airship go farther on less fuel. It also allows it to lift more weight. It can raise 80 tons and travel 2,000 miles (3,218 km) without refueling.

Above: Many way-out airships are planned for the future. But this is the kind of lighter-than-aircraft that is still the most popular. These blimps are mostly for sightseeing or for taking pictures from the air.

The LTA-20 travels about 70 miles (112 km) an hour.

The one disadvantage of the new airships is that they're slow. So they will never replace airplanes, just as trucks will never replace cars. But for hauling heavy loads in places with bad roads, they can't be beat.


A small working model of the LTA-20 has already been built. Other new LTAs are still on the drawing board. One with solar panels is designed to go around the world. It could be a vacation liner like the Love Boat. Another one is a one-person scout ship which could be used for shore patrol.

How soon will you actually be seeing these new LTAs in the sky? Probably not until the end of the 1980s at least. So don't pack your bags yet. But if things go as the inventors say, someday you might travel by LTA. Or at the very least, your house might be delivered by one!

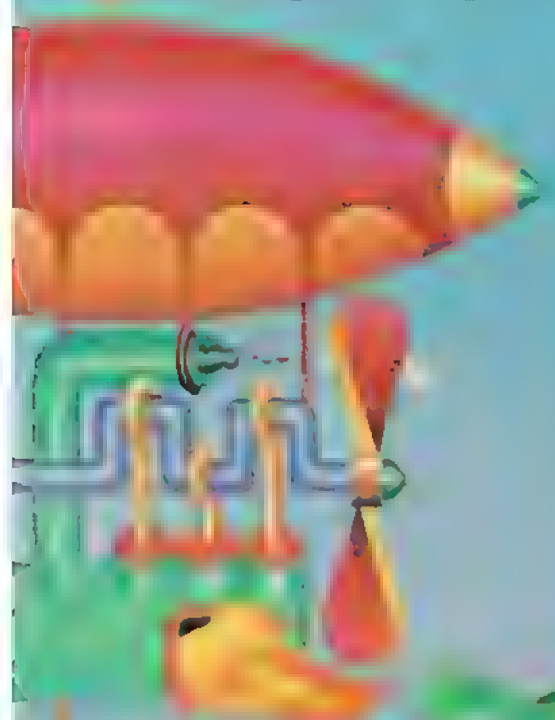
List of the Month Famous First Flights

People have been flying for about 200 years. They have gone up in everything from balloons to bicycles. Here are eight famous flights that set records.

High-Flying Rooster Who made history on the first flight of a hot-air balloon? Two hundred years ago in France, a rooster, a sheep and a duck became the first passengers to fly in a balloon! Their trip lasted eight minutes. Watching from below was a large crowd of French people. Also on hand was a famous American—Benjamin Franklin.



First Blimp Plans for a lighter-than-air flying machine were first made back in 1783. But it wasn't until much later that the first one got off the ground. In 1851, Henri Giffard, a Frenchman, launched the first successful blimp. His airship had a helium-filled balloon. There was a rudder for steering. And there was a coal-burning steam engine for power!



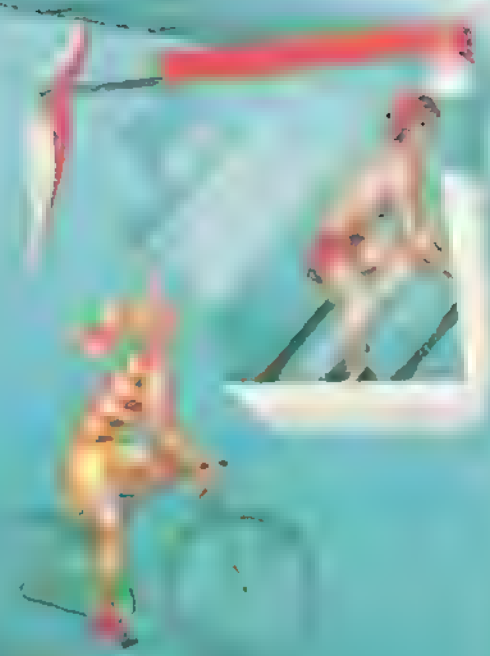
Flying Solo Charles Lindbergh became the first person to cross the Atlantic alone in an airplane. On May 20, 1927, he took off from New York in "The Spirit of St. Louis." He landed in Paris, France, 33½ hours later. The next flier to go it alone was a woman named Amelia Earhart. Five years later, she made it from Canada to Ireland in 14 hours and 56 minutes.

Crazy Crossing For more than 100 years, people tried to cross the Atlantic Ocean in balloons. On August 16, 1978, Ben Abruzzo, Maxie Anderson and Larry Newman became the first to do it. They went from Maine to France in the *Double Eagle II*, a helium-filled balloon. The trip took nearly six days. Why did they do it? "I do something a little crazy every day," said Larry.





Pedal Power Ever wish you could fly using nothing but muscle power? Until six years ago, that was just a dream. Then Dr. Paul MacCready built the Gossamer Condor. This aircraft was made of light-weight plastic. It looked like a glider with wings. On August 23, 1977, Bryan Allen hopped on and began pedaling. Before he stopped, he had flown three miles (4.8 km).



All Wright! The idea for the first airplane started with a simple kite. Pretty soon, though, Orville and Wilbur Wright figured out how to add a motor to their kite. Then came the big step. On December 17, 1903, Orville flew on his stomach between the wings of his plane. This famous first flight near Kitty Hawk, North Carolina, lasted just 12 seconds! But it made history.



Spaced Out People have been floating around in space on and off for the past 20 years. But when the first person completed a orbit around the earth, it was big news. On April 12, 1961, Russian astronaut Yuri Gagarin spent nearly two hours in outer space. When he returned, Yuri said it was too good to be true in space. No kidding!

Rocket Rerun Until a couple of years ago, every time a new trip into space was planned, a new rocket ship had to be built. But on November 12, 1981, the space shuttle Columbia became the first rocket to be used a second time. Now there are three shuttles that can be used. Every time there is a shuttle mission one of them will fly into space, then glide back to earth and land like a plane.



Contact Report

by Michele Lyons

Hot Stuff Some types of wood make warmer fires than others. That "red hot" news was made by 13-year-old Curt Cleven of Rockford, Illinois.

Curt wondered whether different types of wood gave off differing amounts of heat when burned. "The idea came to me while collecting wood for my grandmother," he said.

Curt tested 41 types of wood. He heated tiny pieces of each in a tin cup. Attached to the cup was a chimney made from coffee cans. The heat went up the chimney and warmed a dish of water above it. Curt took the temperature of the water. Then he used some math to figure out how much heat each type of wood gave off.

"It took lots of patience to do the same thing for each type of wood," says Curt. And it took lots of time, too. Curt worked on his project for five months after school, on weekends and even during vacations. So was it worth it? Sure. And Curt has the science awards to prove it!

Story suggested by David Traugott, Urbana, IL.



Curt found out what wood burns hottest.



Tremendous Trees Redwood trees usually grow in forests. But with the help of Ernest Ball and some other University of California scientists, they grow in laboratories, too.

Ball starts by taking a leaf or a piece of stem from a full-grown redwood tree. Then he puts the sample into agar, a special "jello-like" substance made from seaweed. That helps the sample form buds. When these buds get big enough, roots start to grow. After about a year, the plant is ready to live outdoors.

Why bother with all this? Ernest says trees grown the natural way are sometimes sick and weak. This new method takes only the best material from good, solid trees. That makes sure the new trees will be strong and healthy, too.

So far, Dr. Ball has grown thousands of redwoods in his laboratory. Fifth graders at schools near the lab helped plant many of them. That's one science project that keeps growing and growing and growing!

Now young tree shoots like this are grown in labs.

Contact Report

Frog Wax Most frogs have to live near water. Unless they stay wet, they dry out and die.

But a California scientist named Rodolfo Ruibal has found a type of frog that can spend a long time out of water. It's the Argentine tree frog. It lives in parts of Argentina where the climate is dry. But it gets along very well because its skin gets a daily coating of wax. The wax holds water inside the frog's body.

These bright-green frogs have special glands in their skin that make wax. Every morning before these critters go to sleep for the day, the wax oozes out. Then the frog rubs its whole body with its feet to spread the stuff around. The wax doesn't have any color at all. And it takes only about 15 minutes to dry.

How's that for a quick and easy wax job!

Story suggested by Mary Ruth Summers,
Huntington Park, CA.



Here is a frog complete with a coat of wax.

Prehistoric Bug Most bugs don't last long. They get stepped on, eaten up or swatted. But George Poinar, an insect expert in California, owns a bug that's 40 million years old!

The bug isn't alive. It's a fossil trapped in hardened sap. "I bought the sap because I noticed an insect in it," Dr. Poinar says.

This bug, a fungus gnat, died after it was trapped in sticky tree sap. "The sap had sugars that kept the bug from wasting away," says Poinar.

Poinar is now doing research on the bug. Under a powerful microscope, he can see its muscles and cells. It is better preserved than other insect fossils. After 40 million years, it's a gnat-ural wonder!

Story suggested by Jacqueline McCoury,
Asheville, NC.

What's That? Did you read about some kid who invented an electric nosewarmer? Or one who set some new science record? Then cut out the newspaper or magazine story and send it to us. If we use your story, we'll send you a CONTACT T-shirt. Be sure to include your name, age, address and T-shirt size. You must include the name of the newspaper or magazine. Write to:

The Contact Report
P.O. Box 599
Ridgefield, NJ 07657



This bug is 40 million years old.

321 CONTACT

POSITION

Space shuttle
170 miles
(273.5 km)

Unmanned
satellite
100–150 miles
(160–241 km)

Unmanned
balloon
27 miles
(43.4 km)

Hot-air balloon
10.4 miles
(16.7 km)*

Helicopter
7.7 miles
(12.4 km)*

Commercial jet
6.6 miles
(10.6 km)

Cirrus cloud
8.5 miles
(13.7 km)

Two-passenger
plane
1.9–2.7 miles
(3.2–4.3 km)

Whooper swan
(highest-flying
bird)
5.1 miles
(8.2 km)*

Hang glider
2.6 miles
(4.2 km)*

Mexican or
Brazilian
free-tail bat
(highest-flying
bat)
1.8 miles
(2.9 km)*

Cumulus cloud
1.5 miles
(2.4 km)



Robin and Bluebird (migrating)
1,000 feet
(305 m)*

Eagle
200–500 feet
(61–152.4 m)



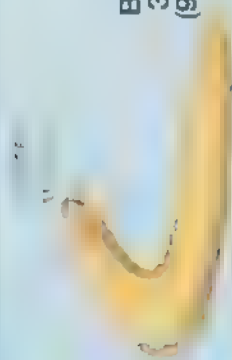
Kite
5–500 feet
(1.5–152.4 m)



Robin and Bluebird
40–50 feet
(12.2–15.2 m)



Boomerang
30–40 feet
(9.1–12.2 m)



Butterflies
20–30 feet
(6.1–9.1 m)



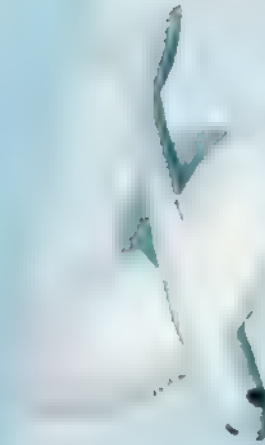
Bees
20–30 feet
(6.1–9.1 m)



Dragonflies
20–30 feet
(6.1–9.1 m)



Flying fish
36 feet (11 m)



Ladybugs
20–30 feet
(6.1–9.1 m)



Gossamer Condor (people-powered flycycle)
1–20 feet
(.3–6.1 m)



Housefly
12 feet (3.7 m)



The Return of the Boomerang



by William and Loretta Marshall

Although boomerangs first came from Australia, now they're making a big hit everywhere. Lots of people are discovering the fun of playing with a toy that comes back when you throw it. Others are even making a sport out of boomerang throwing.

These days, some people are becoming boomerang experts. One is Ben Ruhe. He's captain of the American team that won the first world boomerang championship. Ben says, "Fun is what the boomerang boom is all about." Throwing is only part of the fun, though. Watching it return to you and catching it is pretty neat, too.

Boomerangs weren't always just for fun. In Australia, several different kinds were invented by the aborigines (ab-or-RIDGE-uh-nees), the earliest people who lived there. Small curved boomerangs were occasionally used for hunting birds.

But their main purpose was for sport and games.

The aborigines also made another kind of boomerang. It was sometimes called a throwing stick. A hunter could bring down a kangaroo with it from 500 feet (160 m) away. These big boomerangs were good weapons in war, too. But they didn't come back.

To describe their different boomerangs, the Australians had 300 different names. They ranged from *barngheet* to *tootgundy*. Today, there's one kind of boomerang that you'll hear much about. That's the simple returning model. To anyone who has ever watched one fly, it's amusing and amazing.

Why Do Boomerangs Return?

Is it hard to believe that you can actually toss a boomerang away, then watch it turn and head back? Well, believe it! Here are the facts about why a boomerang acts as it does.

People used to think that the angled shape or a twist in the wings were the main reasons a boomerang comes back. But they're not. In fact, there are many different sizes and shapes of boomerangs. They fly and return about equally well.

A boomerang looks simple. But a lot of different forces must work together to make it come back. Take its arms, for example. On a wooden or plastic boomerang, they are shaped like airplane wings. They are curved on one side, flat on the other. The air passes over the curved side faster. And the air below that's moving slower pushes up. That gives the boomerang lift.

The engine that powers the boomerang is your arm. When you throw the boomerang, it gains forward motion. That's called *thrust*. But the secret to the throw is to flick your wrist. That gives the boomerang spin. It turns in circles like a top.

You are what makes all these forces work

together. The *spin* you gave the boomerang, plus the forward motion, make the part on top move faster than the part on the bottom. Because the forces are uneven, the boomerang begins to turn. It's similar to how your bike turns when you're riding with no hands and lean in one direction.

Then, on the return, the boomerang flattens out as the spin slows. Finally, gravity overcomes the forces of flight. The boomerang falls to earth. It usually lands near where it was launched. But a boomerang could go somewhere else instead. It all depends on how you throw it and the design of the boomerang itself.

Boomerangs were first made of wood. Today, they're made out of anything from plastic to pizza boxes. You can learn to make and throw a simple cardboard boomerang, too. Start with the pattern for a lightweight indoor one on the next page.

Many happy returns! ➡



Make A Cardboard Boomerang

Using the pattern below, you can make your own cross-armed boomerang. It looks a little different from the open V shape you'll see elsewhere. But don't worry. This one is easy to fly and returns well. Australians call it a *pirbu pirbu*.

What You Need:

A cereal box at least seven inches (17 cm) wide or a plain piece of cardboard the same size
Typing paper or notebook paper
Pencil or pen
Paper clips
Scissors

1. Put a sheet of paper on this page. Attach it with paper clips. Trace the pattern and the center hole. Remove the paper. Cut out the shape with scissors. Now you have a paper model to make your boomerang.

2. Cut out one of the large sides of the cereal box. Put the paper model down on the plain side. Attach it with paper clips. Draw a line all around the edge. Draw another line around the hole in the middle.

3. Using scissors, cut out your cardboard boomerang. Then remove the paper model and paper clips. Carefully cut out the center hole, too. Now you're ready to practice throwing!

Throwing Tips

A cardboard boomerang is too light to throw outdoors. So find a space inside. The larger it is, the better you can throw. But boomerangs have a way of flying wherever they want to. So pick a room where nothing will break.

Hold one wing of the boomerang at the end between your thumb and forefinger. The boomerang should be at your ear level and straight up and down. Keep the printed side toward your cheek.

Throw your boomerang overhand, straight ahead—not like a frisbee. You don't have to throw too hard. Just before you let go, flick your wrist to give it spin. Pretend you're cracking a whip.

Your boomerang should sail out, turn and come back to land near you. Not that time? Well, try again. Experiment with different tosses until it begins to return.

Fine Tuning Your Style

Did your boomerang start to circle but then sail away? You probably slanted it toward your body during the launch. Hold it straighter.

What if your boomerang crashed into the ceiling? Or did it rise almost straight up and drop to the floor? Either way, it probably slanted away from you during the launch. Straighten it up.

The Boomerang Sandwich

Practice catching your lightweight model as you would a heavier one. As it swoops in to land, put one hand below and one above it. Clap your hands together to make a boomerang sandwich.

Once you've mastered the basic moves, you can experiment. Try different launch angles. You're a flying ace? Then try to circle your boomerang around a chair or land on a target. Keep at it. You may become an accuracy champ.

Later, you may want to try some outdoor flying with a heftier boomerang. Just remember that hardwood and hard plastic boomerangs can be dangerous. Instead, you can buy a soft plastic flyer or make one out of soft balsawood. Go to a hobby shop for advice or check in a library. But look out. Playing with a boomerang might get to be a habit!



COAST TO COAST

Your mission: fly five planes across the United States. But watch it. You could get stuck along the way!

The Board

This U.S. map shows airplane flight paths. The red dots on the paths are spaces. At the end of each flight path is a red airport. Around airports are orange holding patterns. Each airport/holding pattern circle is a space, too.

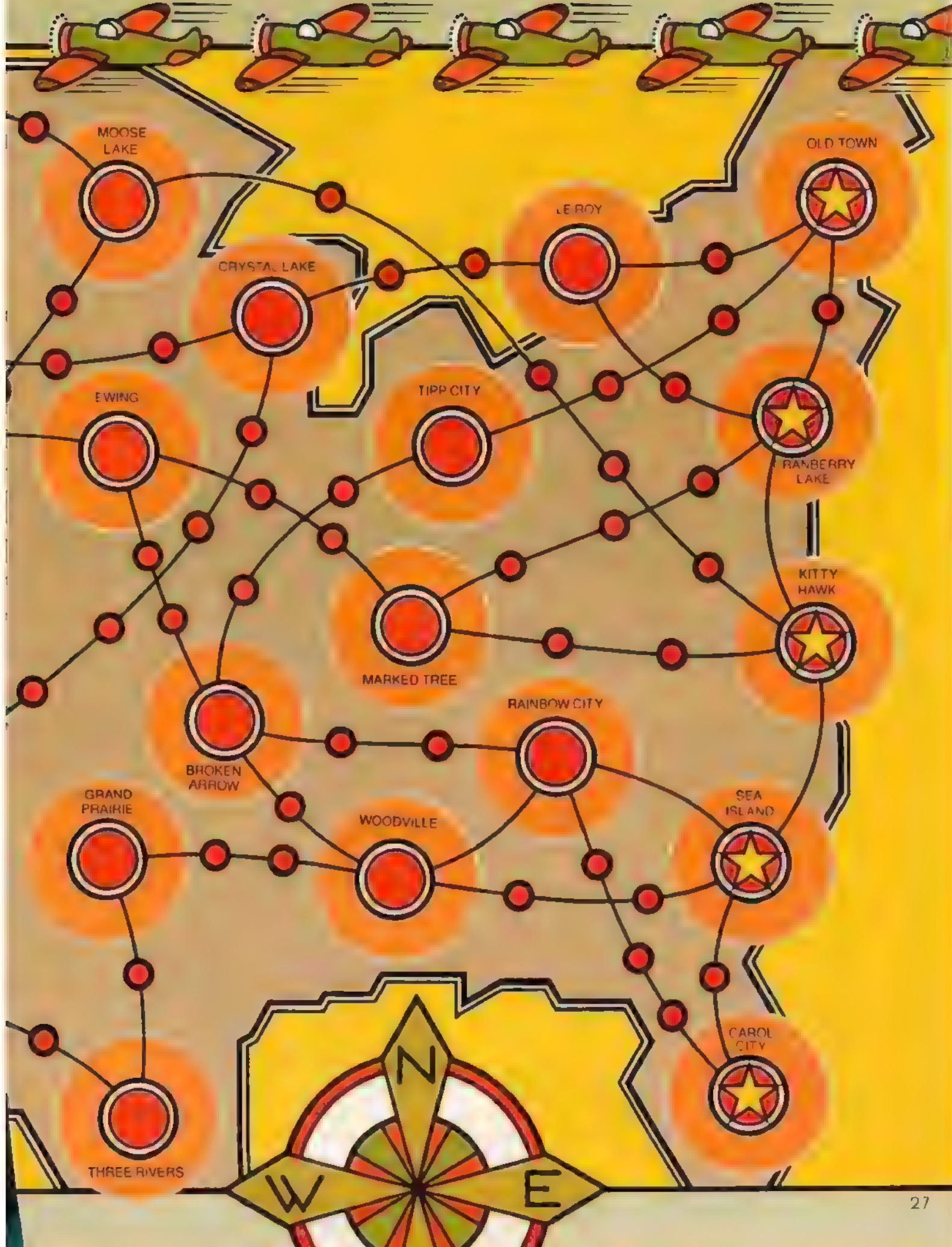
Setting Up the Game

One person uses five pennies as planes. The other uses dimes. Start your five on the airports with stars on one coast. Your opponent takes the other five

How to Play

1. Choose to see who goes first.
2. Roll the dice. Move that number of spaces in a straight line along a flight path. No turning corners.
3. At the end of each move you must stop on an airport—not on a red dot. If it's clear, land. If a plane is there (yours or someone else's) stop on the holding pattern. Any number of planes can be in a holding pattern. If you can't land on either of these, skip a turn.
4. You must stay in a holding pattern until the plane in the airport moves. So move other planes while waiting. When the airport is clear, you can move into it by rolling a one or a six.
5. Anytime you roll a six, you skip to the next airport along a connecting flight path.
6. The first player to land all five planes on the opposite coast wins.





The Bloodhound Gang



The Search for Planet X

Part Two

by Lisa Eisenberg

In the last episode, Vikki and Skip, the newest member of the Bloodhound Gang, flew to Mt. Red Observatory in the Southwest to investigate a case. Someone there had been stealing and selling secret data about the observatory's search for a new planet. The data had been published in an astrology column written by a Professor Moonglow.

At the observatory, Vikki and Skip met astronomers Dr. White, Dr. Nobleman and Mr. Fawley, Lester the custodian, and Brad, a temporary secretary. At the end of the story, Skip and Vikki sneaked into the observatory to plant some false data as a trap. While Vikki investigated some footsteps, Skip vanished!

A worried-looking Vikki met Zack and Ricardo at the front doors of the observatory. She had phoned them the night before, when she discovered Skip's disappearance. They had taken the next plane to Southwest Airport.

"The police have searched high and low," Vikki told them. "And so has everyone else. Skip's just gone!"

As she spoke, Dr. White and Dr. Nobleman came into the lobby. They were followed by Mr. Fawley and Lester. Soon, Brad the secretary wandered in, reading a magazine. Last, Lt. Sheila Winters, the police officer in charge of the case, came in with an assistant named Davidson.

"I'm putting Officer Davidson at the front entrance," Lt. Winters announced. "If anyone sees anything suspicious, notify him at once."

"We're all so worried about Skip," said Dr. White. "Our stolen data problem seems trivial—compared to kidnapping!"

"Professor Moonglow and his helper are really in hot water now," said Vikki.

Mr. Fawley held up a copy of the afternoon edition of the *Desert Daily*. "Has anyone seen this?" he asked. "Professor Moonglow has another Planet X column today."

"I saw that paper at the airport," said Zack. "There's a good article about the IRAS in there." "IRAS?" asked Lester. "Isn't that about taxes?"

"No," said Zack. "IRAS stands for Infrared Astronomical Satellite. It's a robot observatory that's able to 'see' infrared light. That's a form of light—or heat waves, really—which is completely beyond the range of human sight."

"That's right, young man!" boomed Dr. Nobleman. "In fact, we're hoping the IRAS will help us locate Planet X. It's going to survey space beyond Neptune and Uranus. It could detect the infrared heat from an undiscovered planet."

"You'll never convince me there's a planet out there," broke in Mr. Fawley. "Like many other astronomers, I believe it's the gravity from a brown dwarf that affects Neptune's and Uranus's orbits."

"Brown dwarf? Is that one of Snow White's seven pals?" joked Lester.

"No, Lester," said Dr. White. "A brown dwarf is too large to be a planet—yet too small to produce the fires of a real star."

Moonglow Makes a Mistake

Mr. Fawley finished reading Professor Moonglow's new column. "Hey!" he cried. "This column is loaded with errors. I wonder who got this data for him."

"The false data!" cried Vikki. "Skip must have planted it before he was kidnapped." Someone in the back of the room made a move, but Vikki couldn't see who it was. Whoever had supplied that false information to Moonglow was going to have some problems.

Lt. Winters left for a meeting with the FBI, leaving Officer Davidson at the front entrance. Vikki drew Ricardo and Zack to one side.

"Everything points to Skip's still being inside this building," she said. "I was only away from the file room for three minutes before Skip disappeared. During that time, the thief had to steal the data, discover Skip, capture him and hide him. And, I noticed something else."

She pointed to Zack and Ricardo's dusty shoes. "Everyone who comes here tracks in some of that reddish dust on the white floor—which is why Lester is mopping up constantly. Anyway, last night I checked the front lobby as soon as I realized Skip was gone. The only

marks on the floor were our tracks. They were completely undisturbed. No one could have gotten out without walking on them."

"This place is so huge," said Ricardo. "The kidnapper could be moving Skip around, one step ahead of the searchers."

"Or," put in Zack, "an insider could know of a place no one else would find. I think we need to search again when no one's aware of it."

"Well, why don't you keep everybody in one place, Zack?" said Ricardo. "Then Vikki and I can search right now."

"All right," agreed Zack. He went into the telescope room where the astronomers were.

"Can you tell me more about this search for Planet X?" he asked loudly.

"Well," boomed Dr. Nobleman, "you might be interested in some work being done at the Jet Propulsion Lab. They're monitoring radio signals being sent back from Pioneers 10 and 11. They're spacecraft launched in the early 1970s—that are now billions of miles from earth."

"What the lab is measuring," put in Dr. White, "is tiny changes in the spacecraft's paths which could be caused by the gravity of an undiscovered planet. At regular times, tracking stations send radio signals to the spacecraft. The Pioneers return an identical signal. But, by the time it reaches earth, the signal will have changed, depending on the spacecrafts' speed. Changes in speed that can't be accounted for by gravity of known planets, will help reveal the size and distance of any mystery body."

A Hidden Closet

Vikki and Ricardo started their search. When they came to the main hallway, Vikki said, "Let's split up. If you need help, cough. Loud!"

Ricardo walked past Dr. White's office. As usual, Brad was at his desk, busy not working. He was stuffing something into a brown bag. Ricardo tried to look casual so the young man wouldn't realize the area was being searched.

Vikki crept down the hallway. She went into several offices, but all she saw was Lester, emptying trash. At last, she came to a dead end. There was only a custodian's cap hanging on a hook. She turned to leave and walked a few steps away. Suddenly she whirled around and stared at the wall. The sound came again. A faraway ➤➤

"scritch, scritch," like the sound of a slowly sweeping broom.

Vikki went to the wall and ran her hand over it. Her fingers felt a thin crack. All at once, it dawned on her. The cap was hung on a hook, and the hook was on the outside of a broom closet! Frantically, Vikki searched for a handle. At last she touched a small hook. She yanked. But nothing happened. The closet was locked.

She wheeled around and raced to find the custodian. All at once, Lester was in front of her. "The key," she gasped. "To the broom closet. I think...Skip's in there!" She gulped for air.

"Nothing in there but mop buckets, kiddo!"

Suddenly, Vikki remembered that Zack had said an insider might know of a secret place the police had overlooked. The invisible broom closet was a very secret place.

Vikki was still gasping for breath after her run down the hall. All at once, she had a violent coughing fit. "Please," she choked out, "please... open the...closet. Just in case!"

Lester pulled a key from the chain on his belt. Before he could move, Vikki grabbed it. She dashed down the hall and swiftly unlocked the closet. Skip fell out, clutching a broom handle between his two bound hands.

Skip Is Saved

Vikki yanked a cotton gag from his mouth. "Lester's the thief," Skip yelled. "I hid under the desk after I planted the data. He was phoning Moonglow to ask for more money...but..."

"But then you sneezed, didn't you, sonny? And I collared you!"

A new voice spoke in the hall. "That's right. And now we have to get rid of these two."

Vikki, Skip and Lester whirled around. There in the hallway stood Brad, Dr. White's secretary.

"Moonglow!" cried Lester.

"You're Professor Moonglow?" gasped Skip.

"Sure he is," snapped Lester. "He wasn't satisfied with the data I was getting for him. So he got himself a job here."

"I'm not that surprised," said Vikki. "I wondered why Brad was coming back here late last night when Skip and I saw him—he's too lazy to come back for work he'd forgotten."

Professor Moonglow ignored her. "You messed things up, Lester, when you grabbed that kid."

All at once a gun appeared in his hand. "And you should have known he was planting phony data. My reputation is ruined!"

"You've ruined more than your reputation, Moonglow! Drop that weapon!" Officer Davidson's deep voice echoed in the hall. Brad's gun clattered to the floor. Slowly, he turned around. The three astronomers, along with Ricardo and Zack, stood just behind the bulky police officer.

"All right, Moonglow. March," said the policeman. "And you too, Lester."

As Brad and his accomplice walked away, Zack hurried over to Skip. "I hope my replacement held up all right!" he said.

"I'm okay. Though I'd been tied up in there so long, I started to think I was a mop handle!"

"I'm sure glad you remembered our coughing signal, Vikki," said Ricardo.

"I'm sure glad you heard it!" Vikki laughed. "And went to get Officer Davidson!"

Later that afternoon, Dr. Nobleman and Dr. White took the Bloodhound Gang to the airport.

"Thanks for all your help," said Dr. White. "I hope our search for Planet X is as successful as your search for Professor Moonglow and his helper, Lester."

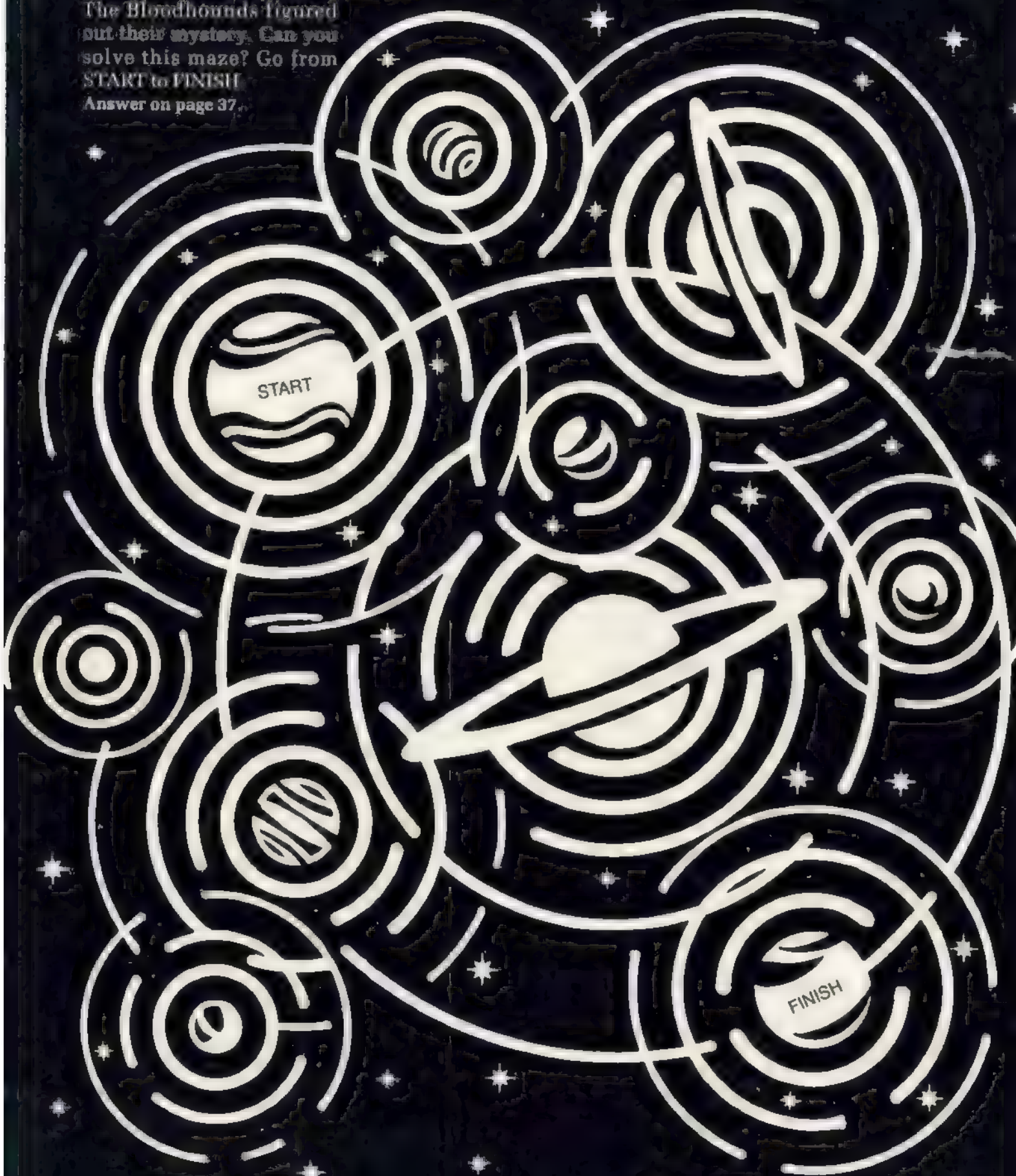
"Well, we hope Mt. Red Observatory has a starring role in the discovery!" said Skip.

**Next month begins
an exciting new
adventure, starring
the Bloodhound
Gang!**



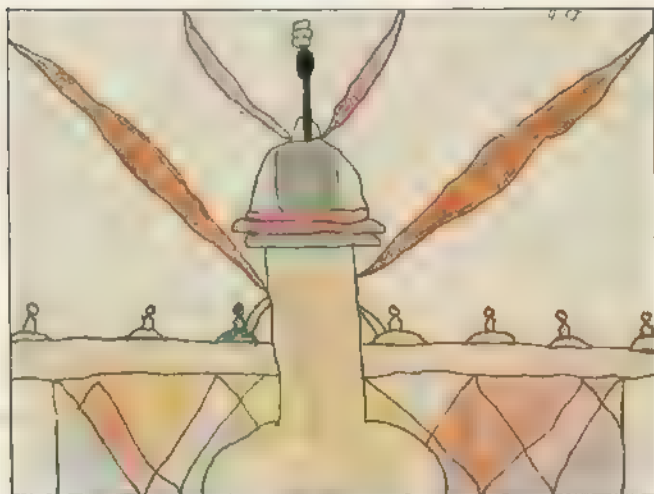
Planet Maze

The Bloodhounds figured out their mystery. Can you solve this maze? Go from START to FINISH.
Answer on page 37.

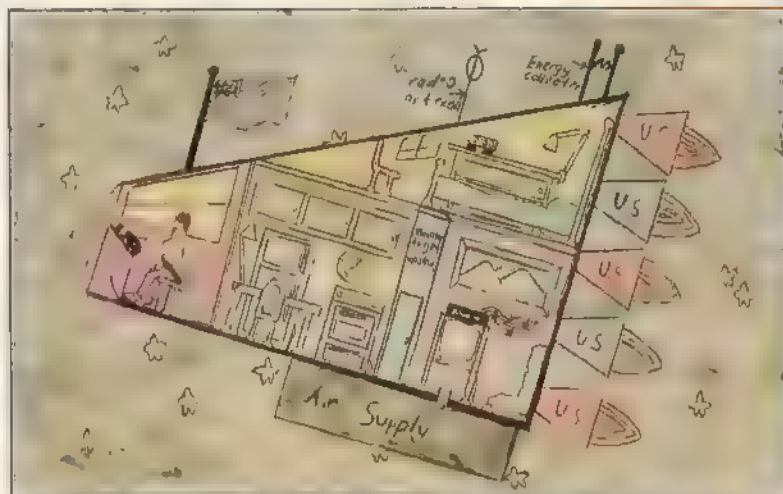


MAIL

Future Homes A few months ago we asked you to send us your ideas for homes of the future. Here are some of our favorites.



Kim Kolodziej, La Vernia, TX. The Electric House has an electric fireplace, a carboat, a food machine and a waterbed swimming pool.



Christina Finlay, North Weymouth, MA. This spaceship home has furniture with suction cups so the tables and chairs won't float.



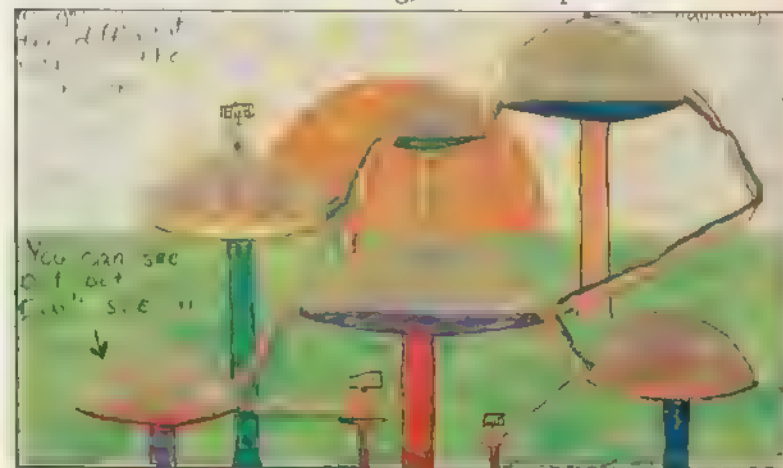
Jimmy Dromberg, New York, NY. More than 100 people can fit in this flying house. They get their water through the black tubes on top.



Adam Stein, Newton, MA. You can get in and out of this underwater home by submarine. The house has all the needs of living, even a computer.

Hidden Contest Back in March 1983, we had a mystery contest. We hid a coin somewhere in the magazine. It was up to you to track it down. Hundreds and hundreds of kids wrote in with the right answer. The hidden coin was in the Bloodhound Gang picture on page 34 of the March 1983 issue. These five readers were the lucky winners we picked at random. Congratulations!

Margaret Bost, Manitou Springs, CO
Troy Butler, Hinsdale, NH
J. High, Statesboro, GA
Nicole Ramey, Milwaukee, WI
Heather Robb, Philadelphia, PA



Sarina Draal, Petaluma, CA. You can see out of these houses but not in. There are even dog and cat houses.

Letters

What's Up?

Dear CONTACT,

What bird can fly the highest and how high can it fly?

Keith Newman
Madison, New Jersey

Dear Keith,

Your letter came at a great time. After all, this is our special issue on flight.

Most birds fly as much as a few hundred feet off the ground. During migration, some of them even get as high as a few thousand feet. But the highest flyer of them all is the whooper swan. It can soar as high as 5 miles (8 km) above the surface of the earth.

If you want to get the whole picture on how high things fly, turn to the poster. It's on page 20.

Poster Hang-Up

Dear CONTACT,

Every time I get sent an issue I find a poster but there's always another story on the other side. I don't want to tear the poster out because I probably haven't read it yet and maybe want to read it again.

Kelly Ayers
Conoga Park, California

Dear Kelly,

We know exactly what you're talking about. A few other kids have let us know that they don't want to tear up their stories either. We think we have the problem solved. Hang up the whole magazine!

Just open the issue to the poster. Then pin the poster, with the entire magazine opened, to the wall.

Now you'll have posters to decorate your room, but you won't have to lose any pages from a story. And, if you want to read something again, you can take the

whole issue down from the wall. It's simple!

Mail Without Fail

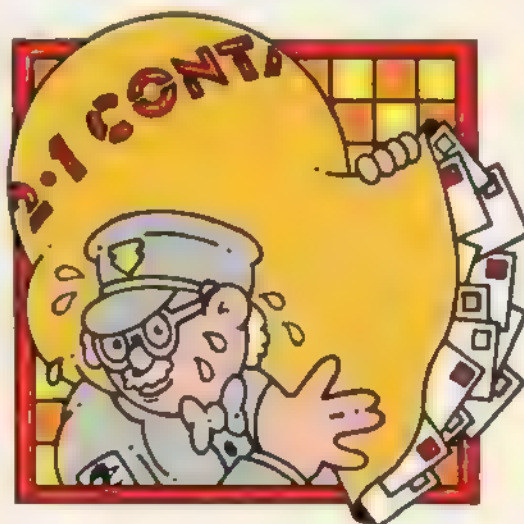
Dear CONTACT,

I would like to know how your mailing system works. This is not a joke letter. I have sent two other letters in this week.

Kathy Maywald
Seaford, New Jersey

Dear Kathy,

Every month we get thousands of letters from kids all over the



United States and around the world. When those letters arrive at our mailing address in New Jersey, they are opened and sorted. The mail is put into separate piles, according to department. Then all the opened and sorted letters are put into big boxes and sent to us in New York. We read every letter and look at all the drawings.

Unfortunately, all this work takes a lot of time—sometimes even a couple of months. That's why, if you write a letter this week, we may not read it until January. But remember, we definitely will read it!

P.S. Yours wasn't a joke letter, but here's a joke from us. What word

has hundreds of letters in it?

You'll find the answer on page 37.

Oops!

Dear CONTACT,

I enjoyed playing the Star Search game which is in the February, 1983, issue of 3-2-1 Contact.

According to the directions, a letter was only supposed to be used one time in each word. However, you included the word neon in your list. As you can see, it uses the letter "n" two times. May I make a suggestion for a substitute word? How about the word "no" which was not on your list.

Thank you for the many hours of challenge and enjoyment which your magazine offers me each month.

Karen Ambrose
Greensburg, Pennsylvania

Dear Karen,

You were one of more than 25 readers who wrote to correct our error. And other readers also wrote to tell us which words we left out. Justin Warner of San Anselmo, California, was one of them. He listed 15 words that we didn't have on our list. Keep up the good work, guys!

We Want Mail!

Dear Readers,

We really love hearing from you. The questions, ideas and complaints we get help us make CONTACT a better magazine. So why not drop us a line? We can't answer every single letter, but we do read them all. Write to:

3-2-1 CONTACT: Letters
P.O. Box 599
Ridgefield, NJ 07657

Extra!

Are you ready to discover faraway planets? Or would you rather go looking for animals in your own backyard? In either case, this month's *CONTACT Extra!* has something for you. But don't take our word for it. See for yourself....

"This Is Your Captain Speaking..."

Ever wonder what it would be like to fly an airplane? You might want to send for "Learning to Fly." This pamphlet answers lots of questions about flying. How old do you have to be to fly a plane? How much does it cost? How long does it take to learn? For these answers and more, write to:

Public Relations Department
Goodyear Tire & Rubber Company
Akron, OH 44316

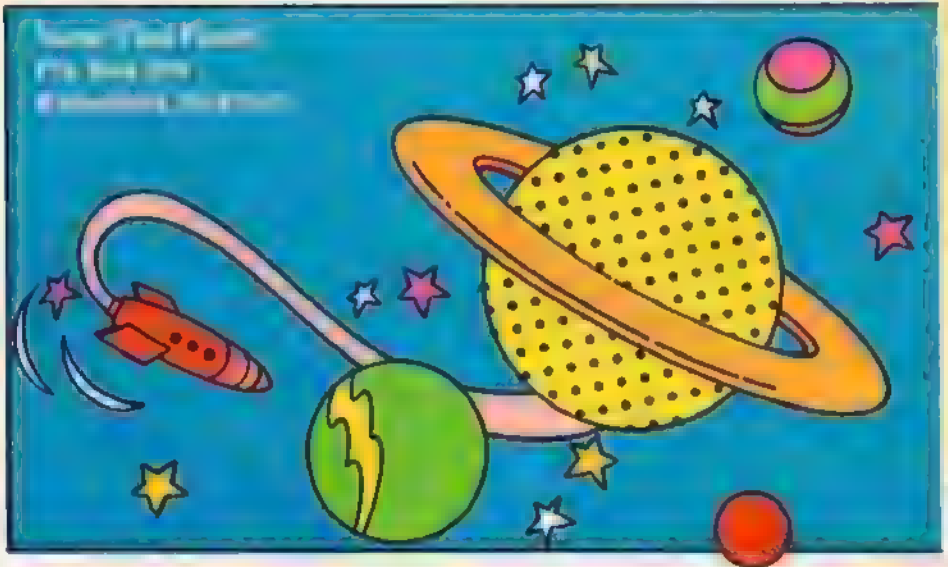
Be sure to include your name and address and to ask for a copy of "Learning to Fly."



Name That Planet!

You read in the *Bloodhound Gang* about the search for Planet X. Now imagine if you were the astronomer who found that planet. What would you name it? Would you name it after a person from mythology? Or would you name it for a favorite baseball player? Or your pet goldfish?

Think up a good name for a new planet and send it to us. Be sure to tell us why you picked the name you did. We will print our favorite names in a future issue. If your choice is one of them, we will send you a *CONTACT* T-shirt. Send your planet name, along with your name, address and T-shirt size to:



Writing High

Look, up in the sky...And you might see some skywriting. If you spot any on November 28, celebrate! That's the anniversary of the first skywriting in 1922. The message was "Hello USA."

The message here is not so simple. It's the answer to this riddle: Who invented the first plane that couldn't fly? To solve it...

1. Read every other letter from left to right. As you go, cross the letters out and write them in the spaces below. We did the first one for you.
2. Fill in the rest of the spaces with the letters that are left over.

T B H R E O W T R H O E N R G S

T

Answer on page 37.

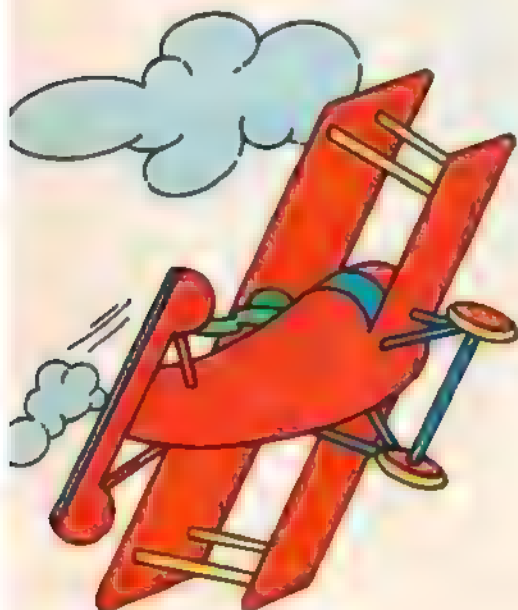




Cranberry Crush

When your family prepares the Thanksgiving feast, you can join in, too. Here's a simple tasty dish that you can make. To do it, you need one pound (2.2 kg) of cranberries, two oranges and sugar.

Carefully cut the oranges into quarters. Don't peel them, but remove any seeds. Then mix the oranges and cranberries together, using a blender or a food grinder. Cover, and blend until well mixed. Pour it into a bowl and stir in sugar until it tastes a little sweet. Cover and store in the refrigerator. Serve proudly when it's time for the big meal!

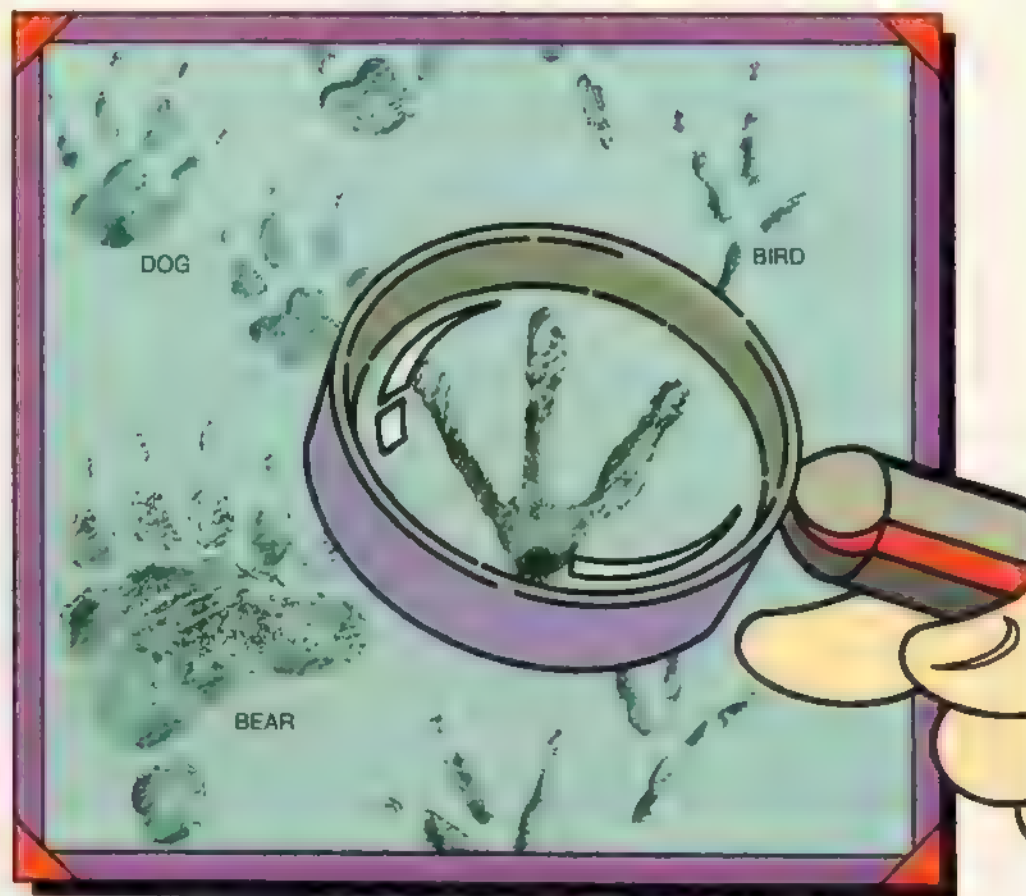


Winter Explorer

Winter is on its way. Days are getting shorter and cooler. As they do, most wildlife begins to disappear. You know that some birds migrate. But where does everyone else go? You can spot many signs of animal life, if you know where to look.

• Insects go under the ground for warmth. Poke under rocks, fallen logs, tree roots and old piles of leaves to find them and their eggs. You'll also see them in cracks in trees and stone walls, or in corners of sheds or garages.

• Not all animals hibernate in winter. Some stick around in snug hiding places. They come out to search for food. If you're a good detective you can spot their tracks in mud or crisp snow. Here are some common tracks to look for:



• If you're not having luck spotting winter life, here's a sure-fire way. Invite some to dinner. Lay out some seeds, broken nuts, crackers or bread. When the ground is covered with snow, the animals will be especially grateful. You might be surprised at the number of small animals that show up for a bite. ➡

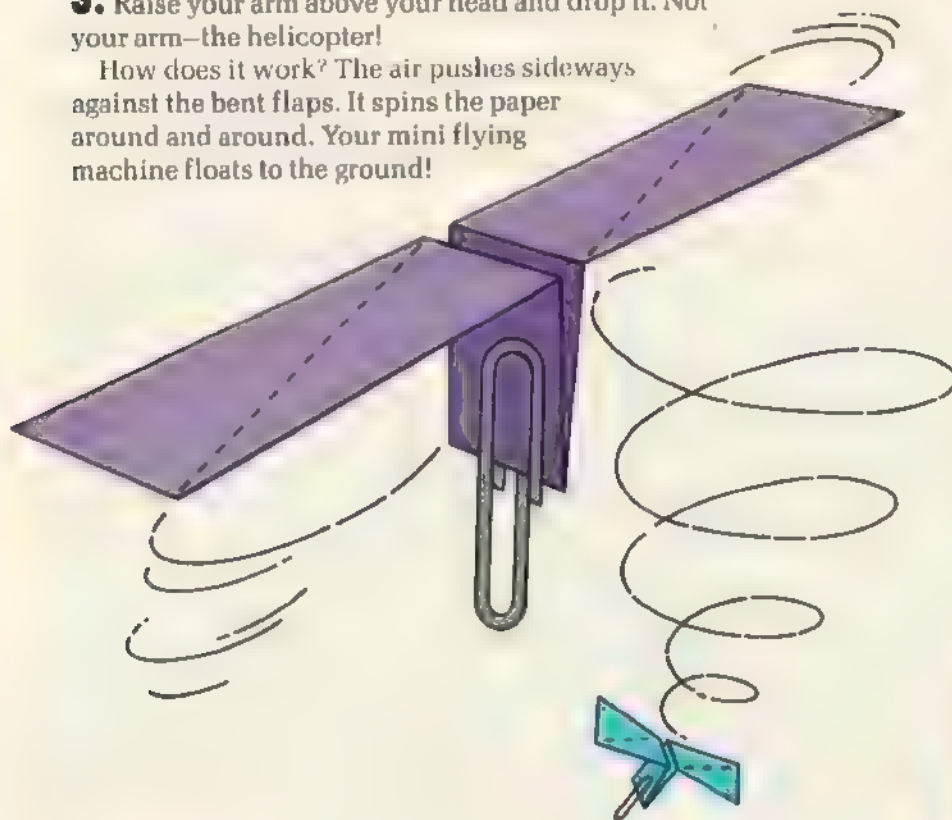
Extra!

Fly Paper

Want to show off your flying talents? What's that, you don't have a plane? How about a helicopter?

1. Cut out a strip of paper, six inches (15 cm) long and one inch (2.5 cm) wide.
2. Fold it as you see here. Don't forget the flaps. Then attach a paper clip.
3. Raise your arm above your head and drop it. Not your arm—the helicopter!

How does it work? The air pushes sideways against the bent flaps. It spins the paper around and around. Your mini flying machine floats to the ground!



Instant Frost

How do you make instant frost? Just add water! In this case, the water comes from the warm, moist air in your lungs. Breathe on the inside of a window on a very cold day. Wait a few seconds. You should see a pattern of frost forming.

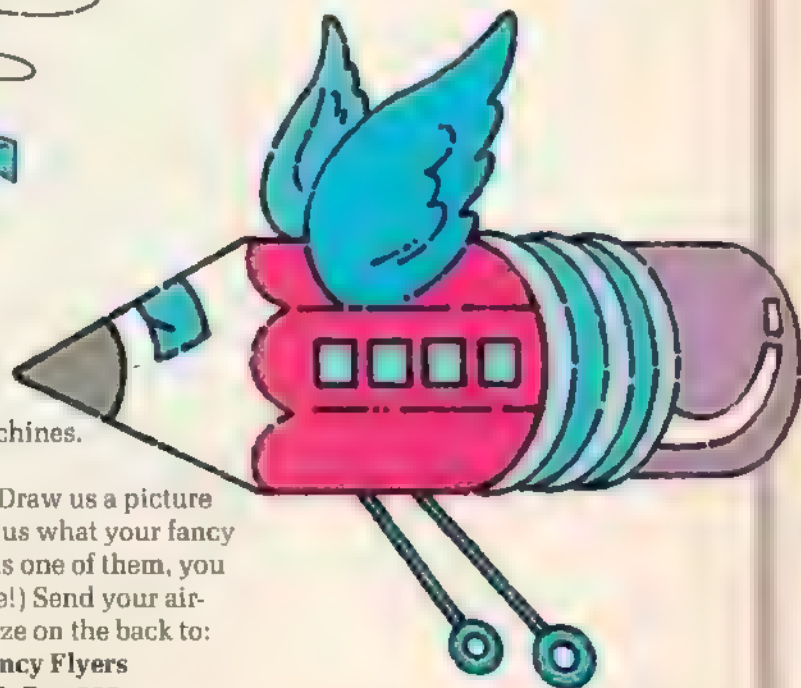
Your warm breath has lots of tiny water particles in it. When your breath hits the freezing cold window, the moisture freezes too.

Flights of Fancy

You read about the new lighter-than-air flying machines. Here's your chance to get into the act.

We want you to invent your own flying machine. Draw us a picture of your fancy flyer. Be sure to give it a name and tell us what your fancy flyer does. We will pick our favorite flyers. If yours is one of them, you will get a CONTACT T-shirt. (Sent air mail, of course!) Send your aircraft picture, with your name, address and T-shirt size on the back to:

Fancy Flyers
P.O. Box 599
Ridgefield, NJ 07657



Did It!

Planet Maze (page 31)



Thank You! Thanks to Dr. Martin Haslanger and Elizabeth Zaic of Squibb and Sons for help with the aspirin question.

Letters page riddle (page 33)

A mailbox

Extra riddle (page 34)

The Wrong Brothers

Credits

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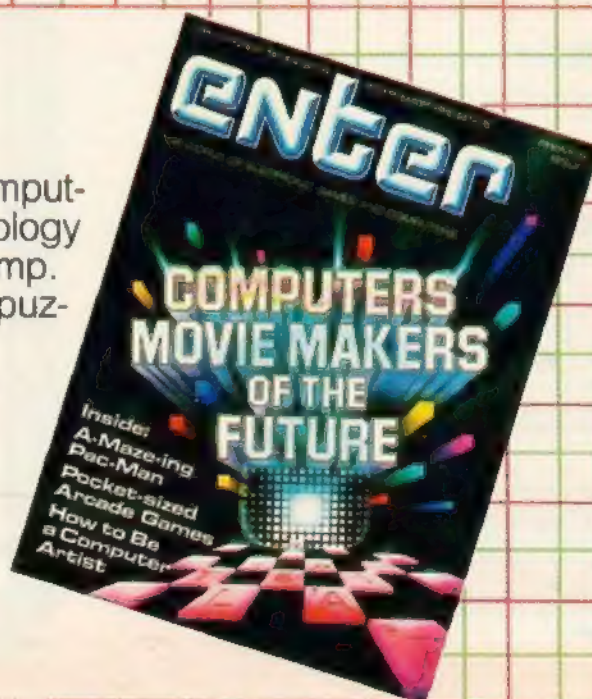
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Earthfacts: Frost

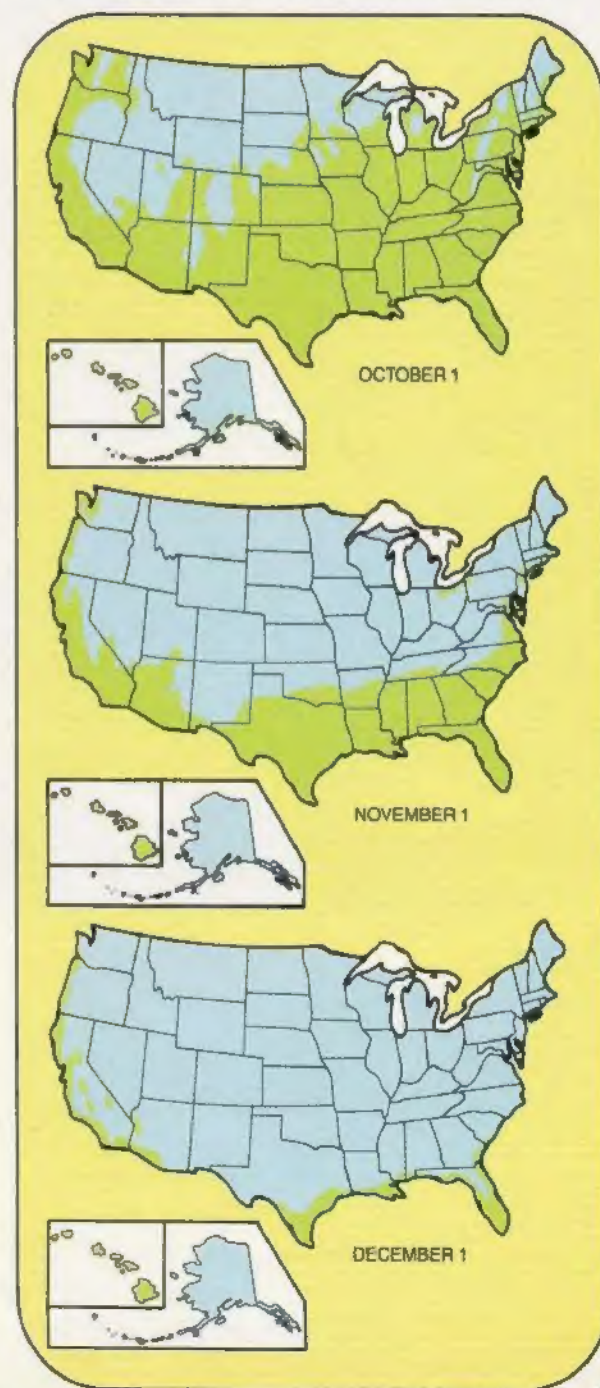
Each month CONTACT will bring you another Earth Works. Save these pages in a notebook. Soon you will have your own guide to the wonders of the planet earth.


- Frost starts with water vapor. That's water that has turned from a liquid into a gas. It is always in the air. But it's invisible so you can't see it. But if the air cools enough, the water vapor turns back into liquid water. This happens on cool nights. Then you wake up in the morning and find drops of water called dew, on the grass. If the temperature falls below freezing the water vapor instead turns into crystals of ice called hoar frost or just plain frost.
- "Clear moon, frost soon" is an old saying. It predicts frost after a clear night. It's true, too. You'll wake up to a frosty morning most often after a night that's cold and clear. That's because on clear nights there are no clouds to hold in the earth's heat. The ground cools more and frost forms.
- Rime frost forms from special fogs called rime fogs. Water drops in rime fogs are super-cooled. That means they stay liquid even though their temperature is below freezing. When the super-cooled drops touch something on the ground which is also freezing, the drops turn into pieces of ice. If it's even colder, say below -20°F (-29°C), a special kind of rime frost forms. It is made of tiny crystals of ice suspended in the air. It sometimes looks like light snow falling to the ground.
- A killing frost is one that kills plants. Frost kills plants by damaging cells. The water in them freezes. Because water expands when it freezes, the cells burst and the plant dies.
- There's a good chance that frost occurs where you live. There are only two places in the United States that don't get frost at all: Hawaii and the very southern tip of Florida.
- In winter, look for frost patterns on your windows. The amount of water vapor in the air will affect the patterns you see. As warm air with lots of water vapor cools on your window it turns to water drops. As it gets colder it freezes and forms a solid sheet of frost. If the same warm air is drier it must get colder for the water vapor to turn to frost on your window. Then it forms directly into ice. And you see frost pat-

EarthWorks

terns that look like ice crystal trees, needles and feathers of dust.

Below: The blue areas show how freezing temperatures move south through the U.S. in fall and winter. Green areas are free of frost.





EarthWorks

Frost

The icy needles on these mint leaves are frost. You might wake up on some cold mornings to find the leaves and grass covered with frost. It makes everything around look like it has been sprinkled with sparkling white crystals. You can't expect to find frost when the weather is warm. You can't even expect it when the weather is just cool. Frost only appears when the temperature falls below freezing. Then water in the air can turn into tiny crystals of ice.

For more on frost turn to page 39.

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